

# Automated Toll Collection System based on Vehicle Type Classification using Sparse-Filtered Convolutional Neural Networks with Layer-Skipping Strategy (SF-CNNLS)

Suryanti Awang<sup>1</sup> and Nik Mohamad Aizuddin Nik Azmi<sup>1</sup>

<sup>1</sup>Soft Computing & Intelligent System Research Group (SPINT),  
Faculty of Computer Systems & Software Engineering, Universiti Malaysia Pahang,  
Lebuhraya Tun Razak, 26300, Pahang, Malaysia  
[suryanti@ump.edu.my](mailto:suryanti@ump.edu.my)

**Abstract.** Automated Toll Collection System (ATCS) is one of the technologies to fulfill the Intelligent Transportation System's (ITS) aim in providing an efficient road and transportation infrastructure at the expressway. This paper is aimed to provide an accurate and efficient ATCS based on a vehicle type classification method rather than the current implementation of toll collection that rely on sensor-based and human observation. To fulfill the aim, we proposed to implement SF-CNNLS framework to extract vehicle's features and classify it into class 1 (passenger vehicle), class 2 (lorry) and class 4 (taxi). This ATCS is aimed to enhance the efficiency of the toll collection in Malaysia. The biggest challenge in this research is how to discriminate features of class 4 as a different class of class 1 since both classes have almost identical features. However, with our proposed method, we able to classify the vehicle with the average accuracy of 90.83 %. We tested our method using a frontal view of a vehicle from the self-obtained database (SPINT) taken using mounted-camera at the toll booth and compare the classification performance with a benchmark database named BIT.